LORDS INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)

Approved by AICTE | Recognized by Government of Telangana | Affiliated to Osmania University

Accredited by NBA | Accredited with 'A' grade by NAAC | Accredited by NABL

Four Year Course Structure and First Year Syllabus

Department of Electronics and Communication Engineering

(With effect from the Academic Year 2023-24)

Sy. No:32, Himayat Sagar, Near TSPA Junction, Hyderabad-500 091, Telangana, India.
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LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-23]
(w.e.f. AcademicYear2023-24)

B.E. I-Semester (Group-A)
(Common to INF, EEE, ECE, CSE-AIML, CS)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
MC: Three Week Induction Programme											
Theory Course											
1	U23EN102	MC	Indian Constitution	2	-	-	2	40	60	3	0
2	U23MA101	BSC	Mathematics-I	3	-	-	3	40	60	3	3
3	U23CH101	BSC	Engineering Chemistry	3	-	-	3	40	60	3	3
4	U23EE101	ESC	Basic Electrical Engineering	3	-	-	3	40	60	3	3
5	U23EN101	HMSC	English for Professional Communication	2	-	-	2	40	60	3	2
Practical/ Laboratory Course											
6	U23CH1L1	BSC	Engineering Chemistry Lab	-	-	3	3	25	50	3	1.5
7	U23EE1L1	ESC	Basic Electrical Engineering Lab	-	-	3	3	25	50	3	1.5
8	U23EN1L1	HSMC	Effective Communication Skills Lab	-	-	3	3	25	50	3	1.5
9	U23ME1L2	ESC	Workshop / Manufacturing Practice Lab	1	-	4	5	50	50	3	3
Total				**14**	**-**	**13**	**27**	**325**	**500**	**27**	**18.5**

L: Lecture (Hrs/Wk/Sem) **T**: Tutorial (Hrs/Wk/Sem **P**: Practical **D**: Drawing (Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
BSC: Basic Science Course **ESC**: Engineering Science Course
HSMC: Humanities & Social Sciences Including Management Courses
MA: Mathematics **MC**: Mandatory Course
CH: Chemistry **ME**: Mechanical Engineering
EE: Electrical Engineering **EN:** English

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-23]
(w.e.f. AcademicYear2023-24)
B.E. II-Semester (Group-A)
(Common to INF, EEE, ECE, CSE-AIML, CS)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	U23CH201	MC	Environmental Science	2	-	-	2	40	60	3	0
2	U23EN201	HMSC	Universal Human Values -2	2	-	-	2	40	60	3	2
3	U23MA201	BSC	Mathematics-II	3	1	-	4	40	60	3	4
4	U23PH201	BSC	Engineering Physics	3	-	-	3	40	60	3	3
5	U23CS201	ESC	Programming for Problem Solving	3	-	-	3	40	60	3	3
Practical/ Laboratory Course											
6	U23PH2L1	BSC	Engineering Physics Lab	-	-	3	3	25	50	3	1.5
7	U23CS2L1	ESC	Programming for Problem Solving Lab.	-	-	4	4	25	50	3	2
8	U23ME2L1	ESC	Engineering Graphics & Design Lab	1	-	4	5	50	50	3	3
9	U23EN2L1	HSMC	Design Thinking Lab	-	-	2	2	25	50	3	1
Total				**14**	**1**	**13**	**28**	**325**	**500**	**27**	**19.5**

L: Lecture(Hrs/Wk/Sem) **T**: Tutorial (Hrs/Wk/Sem) **P**: Practical **D**: Drawing (Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation
SEE: Semester End Examination
BSC: Basic Science Courses
ESC: Engineering Science Courses
MC: Mandatory Course
MA: Mathematics
EN: English
CH: Chemistry
ME: Mechanical Engineering
CS: Computer Science
PH: Physics

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, t enable the student to complete the experiment.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
AICTE Model Curriculum (Tentative)
B.E. III-Semester (2024-2025)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
								Maximum Marks			
				L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U23MA301	BSC	Probability and Statistics	2	1	0	3	40	60	3	3
2	U23EN301	HSMC	English for technical Writing	2	0	0	2	40	60	2	2
3	U23EC301	PCC	Electronic Devices	3	0	0	3	40	60	3	3
4	U23EC302	PCC	Signals and Systems	3	0	0	3	40	60	3	3
5	U23EC303	PCC	Digital Electronics	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U23EC3L1	PCC	Digital Electronics Lab	0	0	2	2	25	50	2	1
7	U23EC3L2	PCC	Electronic Devices Lab	0	0	2	2	25	50	2	1
8	U23EC3L3	PCC	Basic simulation Lab	0	0	2	2	25	50	2	1
Skill Development Course											
9	U23CS3L1	ESC	Programming Language - 1	-	-	2	2	25	50	2	1
Bridge Courses*											
10*	U23CS3L2	ESC	C Programming Lab	-	-	2	2	50	-	2	-
11*	U23EN3L2	HSMC	Effective Communication Skills Lab	-	-	2	2	50	-	2	-
Total				13	1	8 (*12)	24 (*26)	300 (*400)	500	21 (*26)	18

***: - Bridge Coursesfor Lateral Entry Admitted Students.**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical / **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation**SEE**: Semester End Examination

HSMC: Humanities and Social Sciences Management Course

EC: Electronics and Communication Engineering

Note:

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
AICTE Model Curriculum (Tentative)
B.E. IV-Semester

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U23EC401	PCC	Analog and Digital Communication	3	0	0	3	40	60	3	3
2	U23EC402	PCC	Analog Circuits	3	0	0	3	40	60	3	3
3	U23EC403	PCC	Network Theory	3	0	0	3	40	60	3	3
4	U23MB401	HSMC	Business Economics & Financial Analysis	2	0	0	2	40	60	2	2
5	U23EC404	PCC	Microprocessors & Microcontrollers	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U23EC4L1	PCC	Analog and Digital Communication Lab	0	0	2	2	25	50	2	1
7	U23EC4L2	PCC	Analog Circuits Lab	0	0	2	2	25	50	2	1
8	U23EC4L3	PCC	Microprocessors & Microcontrollers Lab	0	0	2	2	25	50	2	1
9	U23EC4P1	PROJ	Micro Project	0	0	4	4	50	-	4	2
Skill Development Course											
10	U23EC4L4	PCC	Computer Applications lab	-	-	4	4	25	50	4	2
Total				14	00	14	28	350	500	28	21

L: Lecture*(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical / **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

PC: Professional Core **EC:** Electronics and Communication Engineering

Note:

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
AICTE Model Curriculum (Tentative)
B.E. V-Semester (2025-2026)

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U23MB501	HSMC	Human Values and Professional Ethics	2	0	0	2	40	60	2	2
2	U23EC501	PCC	Electromagnetic Theory and Transmission Lines	3	0	0	3	40	60	3	3
3	U23EC502	PCC	Embedded Systems	3	0	0	3	40	60	3	3
4	U23EE508	ESC	Control Systems	3	0	0	3	40	60	3	3
5	U23EC503	PCC	Computer Organization & Architecture	3	0	0	3	40	60	3	3
6	U23EC504	PCC	Digital Signal Processing	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
7	U23EC5L1	PCC	Embedded Systems Lab	0	0	2	2	25	50	2	1
8	U23EC5L2	PCC	Digital Signal Processing Lab	0	0	2	2	25	50	2	1
Skill Development Course											
10	U23MA5L1	BSC	Aptitude and Reasoning	-	-	4	-	50	50	4	2
Total				17	00	8	21	340	510	25	21

L: Lecture*(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical / **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

HSMC: Humanities and Social Sciences Management Course **PEC**: Professional Electives

OEC: Open Electives PC : Programme Core PROJ : Project

Note:

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SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
AICTE Model Curriculum (Tentative)
B.E. VI-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U23EC601	PCC	Data Communications and Networks	3	0	0	3	40	60	3	3
2	U23EC602	PCC	Antennas and Wave Propagation	3	0	0	3	40	60	3	3
3	U23EC603	PCC	VLSI Design	3	0	0	3	40	60	3	3
4	--	OEC	Open Elective – I	3	0	0	3	40	60	3	3
5	--	PEC	Professional Elective - I	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U23EC6L1	PCC	Data Communications and Networks Lab	0	0	2	2	25	50	2	1
7	U23EC6L2	PCC	VLSI & ECAD Lab	0	0	2	2	25	50	2	1
8	U23EC6P1	PROJ	Mini Project	0	0	6	6	50	50	6	3
Total				15	0	10	25	300	450	25	20

L: Lecture*(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical / **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

PCC: Program Core Course **PEC**: Professional Electives

PROJ: Project Work

Note:
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SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
AICTE Model Curriculum (Tentative)
B.E. VII-Semester (2026-2027)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U23EC701	PCC	Microwave Engineering	3	0	0	3	40	60	3	3
2	U23EC702	PCC	Cellular Mobile Communication	3	0	0	3	40	60	3	3
3	--	PEC	Professional Elective – II	3	0	0	3	40	60	3	3
4	--	PEC	Professional Elective – III	3	0	0	3	40	60	3	3
5	--	OEC	Open Elective – II	3	0	0	3	40	60	3	3
6	U23MB701	HSMC	Organizational Behavior	2	0	0	2	40	60	2	2
Practical/ Laboratory Course											
6	U23EC7L1	PCC	Microwave Engineering Lab	0	0	2	2	25	50	2	1
7	U23EC7P1	PROJ	Technical Seminar	-	-	1	-	50	-	-	1
8	U23EC7P2	PROJ	Summer Internship (During Summer Vacations after VISem)	-	-	-	-	50	-	-	2
9	U23EC7P3	PROJ	Major Project (Phase-1)	0	0	4	4	50		-	3
Total				17	0	7	23	415	410	19	24

L: Lecture*(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical / **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

PEC: Professional Electives **OEC**:Open Electives **PCC**: Program core course

Note:

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SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
AICTE Model Curriculum (Tentative)
B.E. VIII-Semester (2026-2027)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	--	PEC	Professional Elective – IV	3	0	0	3	40	60	3	3
2	--	OEC	Open Elective – III	3	0	0	3	40	60	3	3
3	--	OEC	Open Elective – IV	3	0	0	3	40	60	3	3
4	U23EC8P1	PROJ	Major Project (Phase-2)	0	0	12	12		150	-	9
Total				9	0	12	21	120	330	09	18

L: Lecture*(Hrs/Wk/Sem)***T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

OE: Open Elective **PROJ**: Project **PEC:**Professional Elective

Note:

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SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
(W. e. f Academic Year 2023-24)
PROFESSIONAL ELECTIVE COURSES

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	U23EC604	PEC 1	Optical Communications	3	0	0	3	40	60	3	3
	U23EC605		Digital Image Processing	3	0	0	3	40	60	3	3
	U23EC606		Bio-Medical Electronics	3	0	0	3	40	60	3	3
	U23EC607		Digital Signal Processor Architectures	3	0	0	3	40	60	3	3
2	U23EC703	PEC 2	Wireless Communication	3	0	0	3	40	60	3	3
	U23EC704		Fundamentals of IOT	3	0	0	3	40	60	3	3
	U23EC705		Multirate Signal Processing	3	0	0	3	40	60	3	3
	U23EC706		Digital system Design through Verilog	3	0	0	3	40	60	3	3
3	U23EC707	PEC 3	Satellite Communication	3	0	0	3	40	60	3	3
	U23EC708		Mixed signal Design	3	0	0	3	40	60	3	3
	U23EC709		Introduction to MEMS	3	0	0	3	40	60	3	3
	U23EC710		Information Theory and Coding	3	0	0	3	40	60	3	3
4	U23EC801	PEC 4	Radar Systems	3	0	0	3	40	60	3	3
	U23EC802		Internet of Things and Applications	3	0	0	3	40	60	3	3
	U23EC803		Low power VLSI Design	3	0	0	3	40	60	3	3
	U23EC804		Principles and Applications of AI	3	0	0	3	40	60	3	3

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SCHEME OF INSTRUCTION & EXAMINATIONS [LR-23]
(W. e. f Academic Year 2023-24)

OPEN ELECTIVE COURSES

S. No.	Course Code	Category	Course Title
01	U23EE508	OEC 1	Non Conventional Energy Systems
	U23EE509		Energy Conservation and Management
	U23CS508		Fundamentals Of Database Management System
	U23IT506		Data Structures
	U23ME509		Basics of Mechanical Engineering
	U23ME510		Modern Manufacturing Processes
	U23CE510		Disaster Preparedness and Management
	U23CE511		Civil Engineering Principles and Practices
	U23EC505		Principles of Communication Theory
	U23EC506		IoT Fundamentals
	U23MB501		Business Communication
	U23MB502		Managerial Science and Theory
	U23SH501		History of Science & Technology
	U23SH502		Economic Policies in India

S. No.	Course Code	Category	Course Title
01	U23EE608	OEC 2	Fundamental of Power Electronics
	U23EE609		Electrical Installation and Safety
	U23CS607		Introduction To Programming In Java
	U23IT606		Operating Systems
	U23ME608		Basics Of 3-D Printing
	U23ME609		Optimization Methods for Engineers
	U23CE607		Construction Materials
	U23CE608		Engineering Geology
	U23EC608		Principles of Data Communication and Network
	U23EC609		Embedded Systems
	U23MB602		Total Quality Management
	U23MB603		Innovation Management
	U23SH601		Indian Music System
	U23SH602		Introduction to Art and Aesthetics

S. No.	Course Code	Category	Course Title
01	U23EE711	OEC 3	Introduction to Electrical Vehicles
	U23EE712		Design estimation and Costing of Electrical Systems
	U23CS711		Data Sciences
	U23IT705		Basics of Artificial Intelligence
	U23ME711		Renewable Energy Resources
	U23ME712		Cooling of Electronic Components
	U23CE711		Environmental Systems
	U23CE712		Urban Transportation System
	U23EC711		IOT and its applications
	U23EC712		Sensors for Engineering Applications
	U23MB702		Supply Chain Management
	U23MB703		Start Up Management
	U23SH701		Display Devices
	U23SH702		Comparative Study of Literature

S. No.	Course Code	Category	Course Title
01	U23EE804	OEC 4	Smart Building Systems
	U23EE805		Industrial Automation
	U23CS806		Basics of Machine Learning
	U23IT802		Cloud computing
	U23ME806		Automobile Engineering
	U23ME807		Power Plant Engineering
	U23CE806		Green Building Technology
	U23CE807		Environmental Impact Assessment
	U23EC806		Fundamentals of Wireless Communication
	U23EC807		Fundamental Digital Design using Verilog HDL
	U23MB802		Entrepreneurship
	U23MB803		Digital Marketing
	U23SH801		Corrosion Science and Technology
	U23SH802		Introduction To Philosophical Thoughts

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B.E. I-Semester (Group-A)
(Common to INF, EEE, ECE, CSE-AIML, CS)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
MC: Three Week Induction Programme											
Theory Course											
1	U23EN102	MC	Indian Constitution	2	-	-	2	40	60	3	0
2	U23MA101	BSC	Mathematics-I	3	-	-	3	40	60	3	3
3	U23CH101	BSC	Engineering Chemistry	3	-	-	3	40	60	3	3
4	U23EE101	ESC	Basic Electrical Engineering	3	-	-	3	40	60	3	3
5	U23EN101	HMSC	English for Professional Communication	2	-	-	2	40	60	3	2
Practical/ Laboratory Course											
6	U23CH1L1	BSC	Engineering Chemistry Lab	-	-	3	3	25	50	3	1.5
7	U23EE1L1	ESC	Basic Electrical Engineering Lab	-	-	3	3	25	50	3	1.5
8	U23EN1L1	HSMC	Effective Communication Skills Lab	-	-	3	3	25	50	3	1.5
9	U23ME1L2	ESC	Workshop / Manufacturing Practice Lab	1	-	4	5	50	50	3	3
Total				**14**	**-**	**13**	**27**	**325**	**500**	**27**	**18.5**

L: Lecture (Hrs/Wk/Sem) **T**: Tutorial (Hrs/Wk/Sem) **P**: Practical **D**: Drawing (Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
BSC: Basic Science Course **ESC**: Engineering Science Course
HSMC: Humanities & Social Sciences Including Management Courses
MA: Mathematics **MC**: Mandatory Course
CH: Chemistry **ME**: Mechanical Engineering
EE: Electrical Engineering **EN:** English

U23EN102	INDIAN CONSTITUTION (Common to all Branches)						Mandatory Course
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives:

1. To create awareness among students about the Indian Constitution.
2. To acquaint the working conditions of union, state, local levels, the powers and functions.
3. To create consciousness in the students on democratic values and principles articulated in the constitution.
4. To expose the students on the relations between federal and provincial units.
5. To divulge the students about the statutory institutions.

Course Outcomes:

After completing this course, the student will

1. Know the background of the present constitution of India.
2. Understand the working of the union, state and local levels.
3. Gain consciousness on the fundamental rights and duties.
4. Be able to understand the functioning and distribution of financial resources between the centre and states.
5. Be exposed to the reality of hierarchical Indian social structure and the ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.
6. Discuss the role of Election Commission of India.

UNIT-I

Evolution of the Indian Constitution: 1909Act, 1919Act and 1935Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

UNIT-II

Union Government: Executive-President, Prime Minister, Council of Minister
State Government: Executive: Governor, Chief Minister, Council of Minister
Local Government: Panchayat Raj Institutions, Urban Government

UNIT-III

Rights and Duties: Fundamental Rights, Fundamental Duties, Directive principles of State Policy.

UNIT-IV

Relation between Federal and Provincial units: Union-State relations, Administrative, legislative and Financial, Inter-State council, NITI Aayog, Finance Commission of India

UNIT-V

Statutory Institutions:
Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

Textbooks:

1. D.D. Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi, 9th Edition, 2016.
2. Subhash Kashyap, Our Parliament, National Book Trust, New Delhi, 2015.

Reference Books:

1. Peu Ghosh, Indian Government & Politics, Prentice Hall of India, New Delhi, 2012
2. B.Z. Fadia & Kuldeep Fadia, Indian Government &Politics, Lexis Nexis, NewDelhi,16th Edition, 2020

Course Code	Course Title						Core/Elective
U23MA101	**MATHEMATICS-I (Common to all Branches)**						**Core**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
--	3	1	-	-	40	60	3

Course Objectives:

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

1. To introduce the concepts of sequences, series and their properties
2. To introduce the concepts of functions of several variables and multiple integrals
3. To study vector differential and integral calculus

Course Outcomes:

On completion of this course, students will get the ability

1. Solve engineering problems with the help of Mathematics tool
2. Test for the nature of Sequence and series
3. Calculate the problems on single variable, curvature, evolutes and envelopes and different series
4. Determine the limit, continuity, partial derivatives, Jacobi and maxima and minima of function of several variables
5. Evaluate double and triple integration and learn its applications
6. Explain and apply the concepts of Vector differentiation, gradient, curl and divergence and its integration.

Unit-I

Sequence and Series: Sequence, Series, General properties of series of positive terms, Comparison tests, tests of Convergence D'Alembert's ratio test, Cauchy's nth root test, Raabe's test (All tests without proof), Alternating Series, Series of Positive and negative terms, Absolute convergence and Conditional convergence

Unit-II

Calculus of one Variable: Rolle's theorem, Lagrange's, Cauchy's mean value theorems (with proofs), Taylor's series (without proof), Curvature, Radius of curvature, Circle of curvature.

Unit-III

Multivariable Calculus (Differentiation): Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Euler's theorem and problems, Jacobian, Taylor's series of functions of two variables, Maximum and minimum values of functions of two variables, Lagrange's method of undetermined multipliers.

Unit-IV

Multivariable Calculus (Integration): Double integrals, change of order of integration, Change of Variables from Cartesian to plane polar coordinates, Triple integrals, change of coordinates in triple Integral-Spherical and cylindrical coordinate system.

Unit-V

Vector Calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, Green's theorem in a plane, Gauss's divergence theorem, stoker's theorem (without proofs) and their verification.

Textbooks:

1. B.S. Grewal, "Higher Engineering Mathematics", Khannapublishers,44th edition,2016.
2. Erwin Kreyszig, "Advanced Engineering Mathematics, Wiley,9th edition,2013.
3. R.K.Jain&S.R.K.lyengar,Advanced Engineering Mathematics, Narosa Publications, 4thEdition, 2014.

Reference Books:

1. B.V. Ramana, "Higher Engineering Mathematics",TataMcGraw-Hill,2018
2. N.P. Baliand Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, latest edition
3. H. K. Dassand Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Publishing

Course code	Course Title						Core/Elective
U23CH101	**ENGINEERING CHEMISTRY (Common for All)**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
-	L	T	D	P			
	3	1	-	-	40	60	3

Course Objectives:

1. To understand and apply fundamentals of battery chemistry in Engineering applications.
2. To get acquainted with hard water and corrosion and apply the techniques for softening and corrosion control method.
3. Correlate the properties of materials with their internal structure and their use for Engineering application
4. Exposed to qualitative and quantitative parameters of chemical fuels.
5. To develop the concept of green chemistry in modern trends in engineering.

Course Outcomes:

1. Understand the basic principle of electrochemistry and batteries and exemplify its uses in daily life.
2. Analyze the problems of hard water and apply softening techniques and corrosion control method.
3. Explain the structure, properties and characteristics of engineering materials used in modern technology.
4. Classify chemical fuels and grade them through qualitative analysis.
5. Apply the concept of Green Chemistry to protect mother nature.

UNIT-I

Electrochemistry And Batteries:

Electrochemistry: Types of cells, cell notation, cell reaction and cell potential. Nernst equation and its derivation. Applications of Nernst equation to electrode potential and EMF of a cell. Numerical problems. Types of electrodes, Calomel, Quinhydrone and Glass electrode. Determination of pH by using Quinhydrone electrode.

Batteries: Secondary battery: lead acid battery and Li-Ion battery. **Flow batteries:** Methanol-Oxygen fuel cells.

UNIT- II

Water Chemistry And Corrosion:

Water Chemistry: Hardness of water its types and units of hardness, estimation of hardness by EDTA method. Softening of water by Ion exchange process, reverse osmosis method. Potable water and its specifications, disinfection of water by chlorination and break point Chlorination.

Corrosion: Introduction, causes and its effects. Theories of corrosions-wet corrosion and its mechanism. Factors affecting rate of corrosion.**Corrosion Control Methods:** Cathodic Protection, Sacrificial anodic method, impressed current method and Surface coating method-Electroless Ni plating.

UNIT- III

Polymers: Basics terms in polymers, Monomer and its functionality, Polymers and Degree of polymerization. Types of polymerizations, Classification of Polymers – Thermoplastics and Thermosetting resins. **Preparation, Properties and engineering applications of:Plastics-** PVC and Bakelite. **Fibres:** Nylon 6:6, Kevlar. **Elastomers:** Buna-S.

Conducting polymers: classification Mechanism of conduction in Poly-acetylene, Applications of conducting polymers.

Biodegradable polymers: Introduction, preparation, properties and applications of Polylactic acid.

UNIT- IV

Chemical Fuels : Definition and classification of fuels- Primary and secondary fuels. Solid, liquid and gaseous fuels. Requirements of a good fuel. Calorific Value – HCV and LCV. Theoretical calculations of calorific value by Dulong's formula – Numerical problems. Solid Fuels: Analysis of coal - Proximate and Ultimate analysis. Liquid Fuels: Fractionation of Petroleum. Composition and uses of Gasoline, Diesel and Kerosene. Gaseous Fuels: LPG, CNG -Composition and Uses. Combustion: calculation of air quantities by weight and volume required for combustion of a fuel- Numerical problems

UNIT –V

Green Chemistry & Composites

Green Chemistry: Concept, Principles of green chemistry – Atom Economy, Catalysis and examples of clean technology. **Biodiesel:** Sources, Concept of Trans esterification and carbon neutrality. Properties and significance. **Composites:** Introduction to composites, composition and characteristic properties of composites. Classification of composites and its applications.

Text books:

1. P.C. Jain & M. Jain, Engineering Chemistry, Dhan Patrai and sons Publishing Company, 17thEdn, New Delhi (2019)
2. Rama Devi, Venkata Ramana Reddy and P. Rath, Engineering Chemistry, Cengage Learning, New Delhi (2016)
3. S.S. Dara, S. Chand, A Text Book of Engineering Chemistry, S. Chand Publications, Reprint edition, 2017
4. Puri and Sharma, Principles of Physical Chemistry, Vishal Publications Co.2019
5. Agarwal Shikha, Engineering Chemistry, Cambridge University Publications.

Reference Books:

1. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
2. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.
3. Shashi Chawla, Engineering Chemistry, Dhan Patrai and Company Ltd, Delhi (2015)
4. S.S Dara, Dr K Mukkanti, A text book of Engineering Chemistry, S Chand 2010.
5. OG Palanna , Engineering Chemistry, McGraw Hill Education ,second edition 2017.

Course code	Course title						Core/Elective
U23EE101	**Basic Electrical Engineering**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
....	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives

1. To analyze the behavior of different circuit elements R, L and C and the basic concepts of circuit analysis.
2. To understand the concepts of electromagnetism.
3. To analyze the concepts of AC circuits, RMS value, average value phasor analysis etc.
4. To understand the basic principle of operation and construction of DC machines and Transformers.
5. To understand the basic principle of operation and construction of AC machines.

Course Outcomes

On the completion of this course students will be able to

1. To analyze the DC electrical circuits and measures the parameters of electrical energy.
2. To understand the concepts of electromagnetism.
3. To analyze the AC electrical circuits and measures the parameters of electrical energy.
4. To comprehend the working principle and construction of DC machines and transformers.
5. To comprehend the working principle and construction of AC machines namely Induction motor & Synchronous generator.

UNIT-I

DC Circuits

Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits excited by independent voltage sources; Power and energy, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT-II

Electromagnetism

Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced EMF, Concepts of self-inductance, Mutual inductance and coefficient of coupling; Energy stored in magnetic fields.

UNIT-III

AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only), Three phase balanced circuits, Voltage and current relations in star and delta connections.

UNIT IV

DC Machines

Construction and Principle of operation of DC generator, EMF equation, Types of DC generator and its applications, Principle of operation of DC motor, Back EMF, DC motor types and its applications.

Transformers

Principle of operation and construction of single-phase transformers (core and shell types), EMF equation, Ideal and practical transformers, OC and SC test losses and efficiency.

UNIT V AC machines

Induction Motors

Asynchronous machines, Principle of operation of 3-Φ induction motor, Concepts of slip, Construction, Types and its applications, 1-Φ Induction motor, Principle of operation, Construction, Types and its applications**.**

Synchronous generators

Construction, Principle of operation, Types and applications, OC and SC characteristics.

Text books:

1. J.B Gupta "Fundamentals of Electrical Engineering And Electronics" S.K Kataria & sons.
2. U.A Bakshi & V.U Bakshi. "Basic Electrical Engineering".
3. B L Theraja, A K Theraja "A Textbook of Electrical Technology Volume II AC And DC Machines".
4. D.P Kothari and I.J Nagarath "Electrical Machines 3rd Edition, Tata McGraw hill Publications**.**

Course code	Course title						Core/Elective
U23EN101	**English For Professional Communication** (Common to all Branches)						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
--	L	T	D	P			
	2	-	-	-	40	60	2

Course Objectives:

Students are able

1. To understand the total content and underlying meaning in the context.
2. To comprehend the text to develop language competency
3. To develop vocabulary among the students
4. To practice the grammar skills involved in writing sentences and short paragraphs.
5. To write paragraphs, letters, narrative pieces, reports, etc.

Course Outcomes:

On completion of this course, the student will be able to:

1. Read and write the content meaningfully
2. Comprehend the given texts and respond appropriately
3. Improves proficiency in vocabulary relatively
4. Demonstrate grammar structure precisely in writing sentences and paragraphs
5. Undertake various types of writing confidently

UNIT-I

Reading: Ruskin Bond, 'The Thief's Story'
Vocabulary: Word Building – Prefixes, Suffixes, Root words
Grammar: Articles, Prepositions, Concord
Writing: Paragraph Writing

UNIT-II

Reading: Padma Sachdeva, "Sunrise"
Vocabulary: Word Formation –Blending, Synonyms, Antonyms,
Grammar: Punctuation
Writing: Formal/Official Letter Writing

UNIT-III

Reading: Robots that look like Humans-Article
Vocabulary: One Word Substitutes
Grammar: Common Errors in English
Writing: Basics of Report Writing

UNIT-IV

Reading: William Wordsworth, 'Daffodils'
Vocabulary: Idioms, Phrases
Grammar: Narration (Direct – Indirect Speech)
Writing: Statement of Purpose (SOP)

UNIT-V

Reading: Francis Bacon, 'Of Studies'(Essay)
Vocabulary: Standard Abbreviations
Grammar: Tense

Writing: Blog Writing

Suggested Readings:

1. Kumar, S and Lata, P, Communication Skills. Oxford University Press,2018
2. Yule George, Oxford Grammar Practice, Oxford University Press, Oxford 2019
3. Michael Swan, Practical English Usage. Oxford University Press, 2016
4. Ashraf Rizvi, M, Effective Technical Communication, Tata McGraw Hill, 2nd Edition. 2017.
5. Meenakshi Raman and Sangeeta Sharma. Technical Communication: Principles and Practice. OUP, 3rd Edition. 2011
6. McCarthy M.& Felicity O'Dell, English Vocabulary in Use, 2nd edition, Pubs.2010
7. Ludlow R & Panton F., The Essence of Effective Communication, Prentice Hall

Course code	Course Title						Core/Elective
U23CH1L1	**ENGINEERING CHEMISTRY LAB (Common for All)**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	3	25	50	1.5

Course Objectives:

1. Conduct experiments, take measurements and analyze the data through hands-on experience in order to demonstrate understanding of the theoretical concepts of quantitative analysis while working in small group.
2. Interpret the electro analytical principles with experimental results graphically.
3. Demonstrate writing skills through clear laboratory reports.

Course Outcomes:

1. Analyze the hardness and alkalinity of water.
2. Illustrate the mobility of ions in strong acids and weak acids using conducto meter & Determine the electrode potential of a given solutions.
3. Demonstrate the principles of Colorimetry and Estimate the rate constant.
4. Determine the amount of ferrous ions.
5. Calculate the amount of synthesized drug.

LIST OF EXPERIMENTS

(Note: Minimum ten experiments should be conducted in the semester)

Introduction to Chemical Analysis.

Techniques of Weighing.

VOLUMETRIC ANALYSIS:

1. Determination of strength of Ferrous solution by Dichrometry.
2. Determination of strength of Ferrous solution by Permanganometry.
3. Determination of hardness of water by Complexometric method using EDTA.
4. Determination of strength of Carbonates and bicarbonates in a given mixture .

INSTRUMENTAL ANALYSIS:

Conductometer:

5. Determination of strength of given HCl solution
6. Determination of strength of CH3COOH solution
7. Determination of strength of HCl & CH3COOH in given mixture

Potentiometer:

8. Determination of strength of HCl solution
9. Determination of strength of Ferrous solution.

pH Meter:

10. Determination of strength of HCl solution

Colorimeter:

11. Verification of Beer-Lambert‘s law and determination of Permanganate.

CHEMICAL KINETICS:

12. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

DRUG SYNTHESIS:

13. Synthesis of Drug (Aspirin / Paracetamol).

Textbooks:

1. B.D. Khosla, A. Gulati and V.Garg, _Senior Practical Physical Chemistry“, (R. Chand & Co., Delhi)
2. K. K. Sharma and D.S. Sharma, _An Introduction to Practical Chemistry“, (Vikas

publishing, N. Delhi

Course code	Course title						Core/Elective
U23EE1L1	**BASIC ELECTRICAL ENGINEERING LAB (Common for all branches)**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
....	L	T	D	P			
	-	-	-	3	25	50	2

Course objectives:

1. Understand the basic concepts of ohms law and theorems with DC excitation.
2. Understand the concepts of self and mutual inductance, coefficient of coupling.
3. Identify Sinusoidal steady state response of R-L, and R-C circuits.
4. Understand the different phenomenon for balanced three phase circuit connected in Star and De
5. Understand the characteristics of DC and AC Machine and performance of Single-p transformer.

Course outcomes:

1. Verify the ohms law and theorems by practical and theoretical calculations.
2. Evaluate of self and mutual inductance, coefficient of coupling.
3. Explain the Sinusoidal steady state response of R-L, and R-C circuits.
4. Analyze the different phenomenon for balanced three phase circuit connected in Star and Delta.
5. Identify the different characteristics of DC and AC Machine and perform tests on Single phase transformer.

Demonstration - 1: Basic safety precautions, Introduction and use of measuring instruments, Voltmeter, Ammeter, Multi-meter, Oscilloscope, Real-life resistors, Capacitors and Inductors.

1. Verification of Ohm's Law, KVL and KCL.
2. Verification of Super position theorem (with DC excitation).
3. Verification of Thevenin's and Norton's theorems (with DC Excitation).
4. Determination of self and mutual inductance, co-efficient of coupling.
5. Sinusoidal steady state response of R-L, and R-C circuits.

Demonstration – 2: Demonstration of cut-out sections of Machines: DC Machine (Commutator- brush arrangement), Transformers, Induction Machine (Squirrel cage rotor), Synchronous Machine (Field winging- slip ring arrangement)and Single Phase Induction Machine.

1. Measurement of phase voltage/current, line voltage/current and power in a balanced three-phase circuit connected in star and delta.
2. OCC characteristics of DC Generator.
3. Transformers: Observation of the no-load current wave form on an oscilloscope.
   (Non sinusoidal wave-shape due to B-H curve non linearity should be shown along with a discussion about harmonics).
4. O.C test and S.C test on single phase Transformer.
5. Measurement of primary and secondary voltages, currents and power of a single phaseTransformer.
6. Open circuit and short circuit characteristics of an Alternator.
7. Power factor improvement of Induction Motor using static capacitor.

Note: It is mandatory to conduct any 8 experiments from the above list of experiments.

Suggested Readings:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.
3. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
4. I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

Course code	Course title						Core/Elective
U23EN1L1	**EFFECTIVE COMMUNICATION SKILLS LAB (Common to all Branches)**						Core
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
--	L	T	D	P			
	-	-	-	3	25	50	1.5

Course Objectives:

Students are able

1. To enhance listening skill of the students
2. To train the students to use correct pronunciation, stress and intonation
3. To equip students to learn the art of conversation in formal and informal situations
4. To promote critical thinking and build team work among students
5. To foster creativity and boost self confidence among students
6. To prepare students for formal presentations

Course Outcomes:

On completion of this course, the student will be able to:

1. Listen and interpret spoken language productively
2. Speak English with neutralized pronunciation, stress and intonation
3. Present themselves confidently in formal and informal situations
4. Expand critical thinking and acknowledge team work effectively
5. Develop creativity and speak confidentlyin individual and group activity
6. Create formal presentations dynamically

LIST OF ACTIVITIES

1. Listening for comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Conversation Skills
4. Introducing Oneself and Others
5. Asking for and Giving information
6. Making Request and Responding to them Appropriately
7. Giving Instructions and Responding to them Appropriately
8. Making Formal Announcement and Emceeing
9. Group Discussion
10. Just A Minute (JAM)
11. Debate
12. Formal Presentations

Suggested Readings:

1. Board of Editors. Language and Life Skills Approach, Orient Black Swan
2. Bala Subramaniam, T.A. Text book of English Phonetics for Indian Students, Macmillan
3. CIEFL, Exercises in Spoken English. PART-III, Oxford University Press.
4. Pillai, Radhakrishna G. Spoken English for You – Level II, Emerald Publisher
5. Robert. M. Sher field & et al. Developing Soft Skills. Pearson Education.4th Edition.
6. Ludlow R & Panton F., The Essence of Effective Communication, Prentice Hall

Course code	Course title						Core/Elective
U23ME1L2	**Workshop/ Manufacturing Practices**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	1	-	-	4	50	50	3

Course Objectives:

The Objective of this course is to impart knowledge of

1. Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Steel, Plastic, Composite and other materials for suitable applications.
3. Hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
4. Productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.
5. Engineering Skill development with regard to making components, system integration and assembly to form a useful device.

Course Outcomes :

After completing this course, the student will be able to

1. Differentiate the tools and Fabricate components with their own hands.
2. Examine the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. Perform the Assembling of different components and will be able to produce small mechanisms/devices of their interest.
4. Demonstrate experiments of black smithy, plumbing, carpentry, tin smithy, fitting, house wiring.
5. Select different Engineering Materials and Manufacturing Methods.
6. Develop different techniques used in Workshop and chooses the best material/ manufacturing process for the application.

A. TRADES FOR EXERCISES

1. **FITTING SHOP**
    1. Square fitting
    2. Dovetail fitting
    3. V- Template fitting
2. **CARPENTRY**
    1. End lap joint
    2. T- Bridle joint
    3. Dovetail lap joint
3. **ELECTRICAL & ELECTRONICS /HOUSE WIRING**
    1. Two lamps in parallel with 5 Pin 6amp socket and switches.
    2. Two lamps in series connection with switches.
    3. Staircase wiring.
4. **TIN SMITHY**

1. Square Tin
2. Rectangular Scoop
3. Conical funnel

5. **WELDING PRACTICE**
   1.Lap Joint
   2.V- Butt Joint
   3.T-joint

B. TRADES FOR DEMONSTRATION AND EXPOSURE

1. Machining (Lathe & Drilling)
2. Plumbing (Introduction of tools, joints, couplings, and valves etc)
3. Blacksmithy (Introduction, Round to Square, Square to Octogon)

C. PRESENTATIONS AND VIDEO LECTURES

1. Manufacturing Methods
2. Brazing
3. Glass Cutting
4. Additive Manufacturing
5. CNC LATHE
6. Plastic Moulding
7. Casting
8. Gas Welding

Note: At least two exercises from each trade.

Suggested Readings :

1. H S Bawa, "Workshop Practice", Tata Mc Graw Hill Education Private Limited ,New Delhi, Second Edition, 2009.
2. V Ramesh Babu, "Engieering Workshop Practice", VRB Publishers Pvt Ltd, New Edition, 2009.
3. P. Kannaiah& K. L. Narayana "Workshop manual" 2nd Ed., Scitech publications (I) Pvt. Ltd., Hyderabad.
4. Hajra Choudhury S.K., HajraChoudhury A.K., Nirjar Roy S.K. "Elements of Workshop Technology" Vol-I 2008 &Vol-II 2010 Media Promoters & Publishers Pvt. Limited, Mumbai.
5. B S Raghuwanshi, "A Course In Workshop Technology", Dhanpat Rai & Co. (P) Ltd, Educational & Technical Publishers, Vol-II, 2011.
6. K Venkata Reddy,"Workshop Practice Manual" Sixth Edition, B S Publications Books Pvt.Ltd, Hyderabad.

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OFELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-23]
(w.e.f. AcademicYear2023-24)
B.E. II-Semester (Group-A)
(Common to INF, EEE, ECE, CSE-AIML, CS)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	U23CH201	MC	Environmental Science	2	-	-	2	40	60	3	0
2	U23EN201	HMSC	Universal Human Values -2	2	-	-	2	40	60	3	2
3	U23MA201	BSC	Mathematics-II	3	1	-	4	40	60	3	4
4	U23PH201	BSC	Engineering Physics	3	-	-	3	40	60	3	3
5	U23CS201	ESC	Programming for Problem Solving	3	-	-	3	40	60	3	3
Practical/ Laboratory Course											
6	U23PH2L1	BSC	Engineering Physics Lab	-	-	3	3	25	50	3	1.5
7	U23CS2L1	ESC	Programming for Problem Solving Lab.	-	-	4	4	25	50	3	2
8	U23ME2L1	ESC	Engineering Graphics & Design Lab	1	-	4	5	50	50	3	3
9	U23EN2L1	HSMC	Design Thinking Lab	-	-	2	2	25	50	3	1
Total				**14**	**1**	**13**	**28**	**325**	**500**	**27**	**19.5**

L: Lecture(Hrs/Wk/Sem) **T**: Tutorial (Hrs/Wk/Sem) **P**: Practical **D**: Drawing (Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation
SEE: Semester End Examination
BSC: Basic Science Courses
ESC: Engineering Science Courses
MC: Mandatory Course
MA: Mathematics
EN: English
CH: Chemistry
ME: Mechanical Engineering
CS: Computer Science
PH: Physics

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

UNIT-I

Course Code	Course Title						Core / Elective
U23CH201	ENVIRONMENTAL SCIENCES (Common to all Branches)						Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	40	60	-

Course Objectives:

1. To create awareness and impart basic knowledge about the various types of natural resources.
2. To know the functions of ecosystems.
3. To understand importance of biological diversity.
4. To study different pollutions and the impact on environment.
5. To know social and environment related issues and their preventive measures.

Course Outcomes:

After completing this course, the student will be able to:

1. Describe various natural resources.
2. To understand various biotic and abiotic components of ecosystem.
3. Learn the different conservation techniques of biological diversity.
4. Illustrate the causes, effects and control measures of various types of environmental
5. pollutions.
6. Explain the methods of water conservation, understand the current global environmental issues.

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources – Use and over utilization of surface and ground water, flood, drought **Dams:** Benefits and Problems. Food Resources –effects of modern agriculture, fertilizer-pesticides. Forest Resources –Use and overexploitation Land Resources–Land Degradation, environmental effect of mining, soil erosion and desertification**.** Energy Resources– Renewable and Non-renewable energy resources.

UNIT-II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, river, forest, grassland).

UNIT-III

Biodiversity: Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity.

UNIT-IV

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, solid waste management.

Environment Protection Act: Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation.

UNIT-V

Social Issues and the Environment: Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

Field Work:

- Visit to a local area to document environmental issues – agricultural area/ lake /terrestrial ecosystem.
- Visit to a local polluted area-market/slum area/Industrial area/traffic area.

Textbooks

1. Erach Bharucha, Environmental Studies for undergraduate courses, third edition, UniversitiesPress.
2. R. Rajagopalan, Environmental Studies from crisis to cure, oxford Publication.

Reference Books:

1. A.K. De, Environmental Chemistry, Wiley Eastern Ltd.
2. E. P. Odum, Fundamentals of Ecology, W. B. Sunders Co., USA.
3. M.N. Rao and A.K. Datta, Waste Water Treatment, Oxford and IBK Publications.
4. Benny Joseph, Environmental Studies, Tata McGraw Hill, 2018.
5. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, 2013.

Course code	Course title						Core/Elective
U23EN201	**Universal Human Values-2 (Common to all Branches)**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
--	L	T	D	P			
	3	-	-	-	40	60	2

Course Objectives:

Students are able

1. To help the students appreciate the essential complementarily between values and Skills
2. To ensure sustained happiness and prosperity among all human beings
3. To facilitate the development of a holistic perspective among students towards life and profession
4. To highlight plausible implications of such a holistic understanding in terms of conduct, trustful and mutually fulfilling human behavior
5. To create an awareness on Engineering ethics and human values

Course Outcomes:

On completion of this course, the student will be able to:

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the self and the body, intention and competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature
4. Compare and contrast between ethical and unethical conduct within the society
5. Grasp the right utilization of their knowledge in their streams of Technology

UNIT I: Introduction to Value Education

1. Value Education, Definition, Concept and Need for Value Education.
2. The Content and Process of Value Education.
3. Basic Guidelines for Value Education.
4. Self-exploration as a means of Value Education.
5. Happiness and Prosperity as parts of Value Education.

UNIT II: Harmony in the Human Being

1. Human Being is more than just the Body.
2. Harmony of the Self ('I') with the Body.
3. Understanding Myself as Co-existence of the Self and the Body.
4. Understanding Needs of the Self and the needs of the Body.
5. Understanding the activities in the Self and the activities in the Body.

UNIT III: Harmony in the Family and Society and Harmony in the Nature

1. Family as a basic unit of Human Interaction and Values in Relationships.
2. The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love.
3. Comprehensive Human Goal: The Five Dimensions of Human Endeavour.
4. Harmony in Nature: The Four Orders in Nature.
5. The Holistic Perception of Harmony in Existence

UNIT IV: Social Ethics

1. The Basics for Ethical Human Conduct.
2. Defects in Ethical Human Conduct.
3. Holistic Alternative and Universal Order.
4. Universal Human Order and Ethical Conduct.
5. Human Rights violation and Social Disparities.

UNIT V: Professional Ethics

1. Value based Life and Profession.
2. Professional Ethics and Right Understanding.
3. Competence in Professional Ethics.
4. Issues in Professional Ethics – The Current Scenario.
5. Vision for Holistic Technologies, Production System and Management Models.

Text Books

1. A.N Tripathy, New Age International Publishers, 2003.
2. Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004
3. Bertrand Russell Human Society in Ethics & Politics

Reference Books

1. Corliss Lamont, Philosophy of Humanism
2. Gaur. R.R., Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3. Gaur. R.R., Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.
4. I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar
5. Mortimer. J. Adler, – What man has made of man
6. William Lilly Introduction to Ethic Allied Publisher

Course Code	Course Title						Core/Elective
U23MA201	**MATHEMATICS-II (Common to all Branches)**						**Core**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
--	3	1	-	-	40	60	3

Course Objectives

1. To study matrix algebra and its use in solving system of linear equations and in Solving eigen value problems
2. To provide an over view of ordinary differential equations
3. To study special functions like Legendre and Beta Gamma functions
4. To learn Laplace Transforms and its properties

Course Outcomes

The students will able to

1. Engineering problems through Mathematics knowledge
2. Solve system of linear equations with the help of Matrices and solving eigen value problems.
3. Discuss the methods for solving certain first order differential equations and insight into its applications.
4. Determine solution of certain higher order differential equations and exposure into its applications.
5. Explain Analyze the basic problems of Gamma, Beta and Legendre's functions.
6. Apply the concept of Laplace Transforms in improper integrals and to the ordinary differential equations.

Unit-I

Matrices: Rank of a matrix, Echelon form, System of linear equations, linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigen vectors, Properties of eigen values, Diagonalization, Cayley - Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

Unit-II

Differential Equations of First Order: Exact differential equations, integrating factors, Linear differential equations, Bernoulli's differential equation, Orthogonal trajectories of a given family of curves (Cartesian and polar), Newton's Law of Cooling.

Unit-III

Differential Equations of Higher Orders: Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients, Solutions of non-homogeneous linear differential equations, Method of variation of parameters.

Unit-IV

Special Function: Beta Functions and Gamma Functions, Relation Between Beta and Gamma Function. Power Series Method- Bessel's function, problems on basic properties, Generating function (without proof), Legendre's Differential Equation and Legendre's Polynomial $P_n(x)$, Rodrigue's Formula (without proof).

Unit-V

Laplace Transforms: Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof). Solution of ordinary Differential Equations using Laplace Transforms.

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna publishers, 44th edition, 2016.
2. Erwin Kreyszig, "Advanced Engineering Mathematics, Wiley, 9th edition, 2013.
3. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition, 2014.

Reference Books:

1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill,2018
2. N.P.Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, latest edition.
3. H.K. Dass and Er. RajnishVerma, "Higher Engineering Mathematics", S.Chand Publishing,
4. 1st edition,2011

Course code	Course title				Core/Elective		
U23PH201	**ENGINEERING PHYSICS (Common to all Branches)**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
--	L	T	D	P			
	3	0	-	-	40	60	3

Course Objectives:

1. Awareness on fundamentals of optical properties, fibers in communication, lasers in Engineering
2. Demonstrate the use of crystal structure in device applications and find the solutions of Quantum mechanical problems.
3. Acquire the knowledge on various properties of semiconductors and nanomaterials.
4. Some fundamental laws related to magnetic as well as dielectric properties of materials.
5. Acquire the knowledge of low temperature physics.

Course Outcomes:

After completion of this course, the student will be able to:

1. Classify crystals based on their structure and their appropriate uses.
2. Illustrates working of lasers and optical fibers in high speed communication.
3. To analyze the wave nature and to develop the skills in designing the various electronic devices.
4. Distinguish the materials and can justify their application in divergent fields.
5. To develop the advancement in micro level devices.

UNIT-I

Crystallography: Introduction, Types of crystal systems, Bravais lattices, Lattice planes and Miller indices, Inter planar spacing (Cubic system), Bragg's law, Powder diffraction method.

Crystal defects: Classification of point defects, Concentration of Schottky defects in ionic crystals, Concentration of Frenkel defects.

UNIT-II

Lasers: Introduction, Characteristics of Lasers, Absorption, Spontaneous and stimulated emissions, Pumping process, Population inversion, Einstein's A and B Coefficients, Ruby Laser, Helium Neon Laser, Semi-Conductor Laser, Applications of Lasers.

Fiber Optics: Introduction, Propagation of light through an optical fiber, Acceptance angle, Numerical aperture (NA), Types of Optical fibers and Refractive index profiles, Attenuation Losses in optical fibers, Applications of optical fibers.

UNIT-III

Wave Mechanics: Matter waves –de-Broglie wavelength, Davisson Germer Experiment, Properties and Physical significance of wave function, Schrodinger time dependent and time in-dependent wave equation, Particle in a 1-D box.

Semiconductors and Devices: Bloch's theorem statement, Kronig-Penney model (qualitative treatment), Classification of solids, Intrinsic and Extrinsic semiconductors, Carrier concentration in intrinsic semiconductors, Formation of P-N junction diode and its I–V characteristics, Thermistor and its characteristics, Hall effect and its applications, Solar cell, LED.

UNIT-IV

Magnetic Materials: Classification of magnetic materials, Domain theory (qualitative), Hysteresis on the basic of domain theory, soft and hard magnetic materials, Applications of ferrites.

Superconductivity: Introduction, General properties of super conductors, Meissner effect, Type I and Type II superconductors, BCS theory (qualitative), Introduction to High Tc superconductors, Applications of superconductors.

UNIT-V

Dielectric Materials: Introduction to Dielectrics, Types of polarizations, Electronic, Ionic, Orientational and Space charge polarizations, Expression for Electronic and Ionic polarizability, Ferro electricity, Barium titanate, Applications of Ferroelectrics.

Nanomaterials: Nano scale, Classification of Nano materials, Properties of Nanomaterial: Surface to volume ratio at Nano scale, Quantum Confinement, Nanomaterial Preparation: Bottom-up methods (Sol-gel and CVD) and Top-down method (ball milling), Applications of Nanomaterial.

Text Books:

1. MN Avadhanulu and PG Kshirsagar, "Engineering Physics", S. Chand India Private Limited, 11th Edition, 2019.
2. P. K. Palaniswamy, "Engineering Physics", Scitech India Private Limited, 4th Edition, 2014.

Reference Books:

1. S. Mani Naidu, "Applied Physics", Pearson India Private Limited, 1st Edition, 2010.
2. R. K. Gaur and SL Gupta, "Engineering Physics", Dhanpat Rai India Private Limited, Revised Edition, 2018.
3. S. Vijaya Kumari, "Modern Engineering Physics", S. Chand & Company Limited, 1st Edition, 2010.
4. A. K. Bandopadhyay, Nanomaterials, New Age International, 1st Edition, 2007.

Course Code	Course Title						Core/Elective
U23CS201	**Programming for Problem Solving**						**Core**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

The Objectives of this Course are:

1. To introduce the basic concepts of Computing environment, Algorithm and Flowchart
2. To familiarize the basic concepts of C language such as data types, operators and expressions.
3. To understand modular and structured programming concepts in C
4. To learn the usage of structured data types and memory management using pointers
5. To learn the concepts of data handling using pointers

Course outcomes:

At the end of this course, the student will able to:

1. Formulatesimplealgorithmsandtranslatethealgorithmstoprogramsusingclanguage.
2. Implement conditional branching & iteration and arrays
3. Applythefunctionconceptstoimplementsearchingandsortingalgorithms.
4. Analyze the usage of structures and pointer variable.
5. Apply the concept of pointers for implementing programs on dynamic memory management and string handling.
6. Design and implement programs to store in structures and files.

Unit-I

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and Executed, operating system, compilers etc.).

Idea of Algorithm : steps to solve logical and numerical problems.

Representation of Algorithm: Flowchart / Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Unit-II

Control Structures: Arithmetic expressions and precedence, Conditional Branching and Loops,Writing and evaluation of conditionals and consequent branching.

Arrays: Arrays(1-D,2-D), Character arrays and Strings.

Unit-III

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble ,Insertion and Selection), Finding roots of Equations.

Functions: Functions (including using built in libraries), Parameter passing in functions, call by value. Passing arrays to functions: idea of call by reference

Unit-IV

Recursion: Recursion, Example programs, such as Finding Factorial, Fibonacci series

Structure: Structures, Defining structures and Array of Structures

Unit-V

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), Introduction to File Handling.

Suggested Readings:

1. "Theory and practice of Programming with C", Byron Gottfried, Schaum's Outline McGraw-Hill,1996
2. "Computer Fundamentals and Programming in C", A.K. SharmaUniversitiesPress,2nd Edition, 2018.
3. "Programming in ANSIC", E.Balaguruswamy,TataMcGraw-HillEducation,2008
4. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall of India,1988.

Course code	Course title				Core/Elective		
U23PH2L1	**ENGINEERING PHYSICS LAB (Common to all Branches)**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
--	L	T	D	P			
	-	-	-	3	25	50	1.5

Course Objectives:

6. Enhance the experience of fundamental functioning, analyzing and characterization of different experiments.
7. Develop skills in the design and development of various electronic devices.
8. Create interest in working with lasers and semiconductor devices.
9. To gain the knowledge on mechanical properties.
10. Acquire the knowledge of communication through optical fiber.

Course Outcomes:

1. Apply the basic principles of lasers and optical fibers to determine wavelength an numerical aperture.
2. Remember the basics of electrical properties and apply to semiconductors.
3. Evaluate the carrier concentration of semiconductor materials by applying Hall effe principle.
4. Apply the basic knowledge of semiconductors and understand the I-V characteristics of p-junction diode, solar cell and LED devices.
5. Analyze the temperature dependence on resistance by Thermistor Experiment.
6. Understand the concept of rigidity modulus through Torsional pendulum.

List of Experiments:

1. Determination of wavelength of a Laser by using diffraction Grating.
2. Determination of Numerical aperture of an optical fiber.
3. To draw the I-V Characteristics of a p-n junction diode.
4. Determination of carrier concentration and Hall Effect of Ge crystal using Hall Effect experiment.
5. To determine the constants of A and B using Thermistor Characteristics.
6. Determine the Energy gap of semiconductor diode.
7. To draw the I-V Solar Cell and to calculate the:
   i) Fill factor Efficiency ii) Series resistance
8. Determination of rigidity of modulus of a given wire using Torsional pendulum.
9. Photoelectric Effect: To determine the work function of a given material.
10. Plot the I-V characteristics of LED.
11. To determine the Quality factor of series/parallel LCR circuit.
12. To determine the time constant of RC circuit.

Note: Minimum 8 experiments should be conducted in the semester**.**

Text books:

1. N.K. De, "Basic Electrical Engineering" Universities press, 2015.
2. J.B. Guptha, "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons
Publications 2002.
3. J.B. Guptha, "Utilization of Electric Power and Electric Traction" S.K. Kataria & Sons Publications, 2010.

Course Code	Course Title						Core/Elective
U23CS2L1	**Programming for Problem Solving Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	4	25	50	2

Course Objectives:

The objectives of this course are:

1. To understand the fundamentals of programming in C language.
2. To write, compile and debug programs in C.
3. To formulate solution to problems and implement in C.
4. To effectively choose programming components to solve computing problems.

Course Outcomes:

At the end of the course, the students will be able to:

1. Choose appropriate data type for implementing programs in C language.
2. Design and implement modular programs involving input output operations, decision making and looping constructs.
3. Implement search and sort operations on arrays.
4. To decompose a problem into functions and to develop modular reusable code.
5. Apply the concept of pointers for implementing programs on dynamic memory management and string handling.
6. Design and implement programs to store data in structures and files.

List of Experiments

1. Finding maximum and minimum of given set of numbers & finding roots of quadratic equation.
2. Sin x and Cos x values using series expansion.
3. Conversion of Binary to Decimal, Octal, Hexadecimal and vice versa.
4. Generating Pascal Triangle & Pyramid of Numbers
5. Recursion: factorial, Fibonacci ,GCD.
6. Matrix addition and multiplication using arrays, linear search and binary search using recursive and non recursive procedures
7. Bubble Sort and Selection Sort
8. Programs on Pointers: Pointers to Arrays, Pointer to Function
9. Functions for string manipulations.
10. Programs on Structures and Unions
11. Finding the number of characters , words and lines of given text file.
12. File handling programs.

Suggested Readings:

1. "Theory and practice of Programming with C", Byron Gottfried, Schaum's Outline, McGraw-Hill 1996.
2. "Computer Fundamentals and Programming in C",A.K. Sharma, Universities Press,

2nd Edition, 2018.
3. "Programming in ANSI C", E. Balaguruswamy, Tata McGraw-Hill Education,2008.
4. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall of Indian 1988.

Course Code	Course Title						Core/Elective
U23ME2L1	Engineering Graphics & Design Practice						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	1	-	4	-	50	50	3

Course Objectives

The objective of this course is to import knowledge of

1. Design a system, component and process to meet desired needs within realistic constraints such as economic, environmental, ethical, health and safety, manufacturability and sustainability.
2. Communication effectively.
3. Techniques, skills and modern engineering tools necessary for engineering practice.
4. Different solids and their section in orthographic projections.
5. Cad package and its utility.

Course Outcomes

After completing this course, the student will be able to:

1. Learn basics of Dimensioning, Detail Drawings and Engineering Design.
2. Demonstrate the projection of point's lines, planes then create virtual drawing by using CAD software.
3. Construct the solid projection & Sectioning of the solids and Develop isometric drawing of simple objects Reading the orthographic Projections of these objects.
4. Understanding and visualize. 3D to 2D & 2D to 3D Vice- Versa.
5. Use the knowledge of Engineering Graphics to draw floor drawing, Simple Machine Element, Basic Electrical Drawing, Basic Networking Drawing.

List of Experiments

S No	Topic / Exercises
1	**Introduction to Engineering Graphics** Engineering Graphics, Significance, Drawing instrument used in engineering drawing and types of sheet layout and their folding. Types of lines used in engineering drawing, various lettering and dimensioning formats.
2	**Scales :**Scales, Representation, Units, Representative fraction [RF] Types: a) Reducing, Enlarging & True. b) Plain, Diagonal and Vernier Scale
3	**Conic Sections-I :**Conic section, Types, Construction of Ellipse, Parabola & Hyperbola given focus and eccentricity
4	**Conic Sections-II :**Construction of ellipse [given major and minor axis], parabola [given base and height] & rectangular hyperbola
5	**Engineering Curves** Introduction and Construction of Cycloid, Epicycloid along with tangent and normal, Involutes (involute of triangle, square & circle)
6	**Introduction to AutoCAD :**Basic commands and simple drawings. Demonstrating knowledge of the theory of CAD software [such as : The Menu System, Toolbars (standard, object properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Short menus (Button Bars), The Command Line (Where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects]

7	**Various methods of drawing lines and circles :**Setup of drawing page and the printer, including scale settings, setting setup of modules and drawing limits, ISO and ANSI standards for coordinate dimensioning and tolerances, producing drawing by using various coordinates methods for lines and circles, such as absolute coordinate method, relative coordinate method, polar coordinate method, direct distance method, 2-points method, 3-points & tangent method.
8	**Orthographic Projection :**Principles of Orthogonal Projections-Conventions – Projections of points situated in different quadrants.
9	**Projections of straight lines – I :** Line parallel to both the reference planes, line perpendicular or inclined to one reference plane.
10	**Projections of straight lines – II :** Line inclined to both the reference planes.
11	**Projection of Planes – I :**Perpendicular Planes.
12	**Projection of Planes – II :**Oblique Planes.
13	**Projection of Solid – I :**Axis parallel to HP or VP, Projection of regular solids in simple position.
14	**Projection of Solid – II :**Projections of solids axis Inclined to one or both the reference planes.
15	**Section of Solids-I :**When the sectional plane is parallel or perpendicular to one Reference Plane.
16	**Section of Solids – II :**Sectional plane is inclined to one reference plane.
17	**Development of surfaces :**Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.
18	**Isometric projection-I :**Planes and Principle of isometric projection, Isometric scale, Isometric Views – Conventions lines & Planes.
19	**Isometric projection-II :**Compound solids, isometric Projections of simple solids & compound solids
20	**Conversion of Isometric to Orthographic views.**
21	**Conversion of Orthographic to Isometric views.**
22	**Optional [Any one must be done]** Floor plan windows, doors, and fixtures such as WC, bath, sink, shower, etc. Simple Machine Element Basic Electrical Drawing Basic Networking Drawing

NOTE:

1. At least 20 sheets must be covered.
2. Sheet number 1 to 5 (Graph sheets / drawing sheets)
3. Sheet number 6 to 22 (AutoCAD drawings)

Suggested Readings :

1. Bhatt N.D., Panchal V.M. & Ingle P.R, Engineering Drawing, Charotar Publishing House,53rd Edition, (2018).
2. Shah, M.B. &Rana B.C. Engineering Drawing and Computer Graphics, Pearson Education, 2nd Edition, (2018).
3. Agrawal B. &Agrawal C. M., Engineering Graphics, TMH Publication, 2nd Edition, (2016).
4. Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, (2009).

5. S.N Lal, Engineering Drawing with Introduction to Auto CAD, Cengage Learning India Pvt Lid, New Delhi, (2018).
6. DhananjayAJolhe, Engineering Drawing, Tata Mcgraw Hill Education private Limited, Third print, (2009).
7. K Venkata Reddy, Text Book of Engineering drawing with AUTO CAD, BS Publications, 4th Edition, (2003).
8. (Corresponding set of) CAD Software Theory and User Manuals.

Course code	Course title						Core/Elective
U23EN2L1	**Design Thinking Lab (Common to all Branches)**						**Core**
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
--	L	T	D	P			
	-	-	-	2	25	50	1

Course Objectives:

1. To provide the new way of creative thinking
2. To learn the innovative cycle of design thinking process
3. To develop an understanding of prototype and testing
4. To encourage the understanding, acceptance and appreciation of individual differences
5. To solve practical Engineering problems through innovative product design and creative solution

Course Outcomes:

On completion of this course, the student will be able to:

6. Compare and classify the various learning styles and memory techniques and apply them in their engineering education
7. Analyze emotional experience and inspect emotional expressions to better understand users while designing innovative products
8. Develop new ways of creative thinking and learn the innovation cycle of design thinking process for developing innovative products
9. Propose real-time innovative engineering design and choose appropriate frameworks, strategies, techniques during prototype development
10. Perceive individual differences and its impact on everyday decisions and further create a better customer experience

Unit 1: An Insight to Learning

Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting

Unit 2: Remembering Memory

Understanding the Memory process, Problems in retention, Memory enhancement techniques

Unit 3: Emotions: Experience & Expression

Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers

Unit 4: Basics of Design Thinking

Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts& Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

Unit 5: Being Ingenious & Fixing Problem

Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

Unit 6: Process of Product Design

Process of Engineering Product Design, Design Thinking Approach, Stages of Product

Design, Examples of best product designs and functions, Assignment – Engineering Product Design

Unit 7: Prototyping & Testing
What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing

Unit 8: Celebrating the Difference
Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

Unit 9: Design Thinking & Customer Centricity
Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design

Unit 10: Feedback, Re-Design & Re-Create
Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – **"Solving Practical Engineering Problem through Innovative Product Design & Creative Solution".**

Text/Reference Books:

1. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company.